

AMENDMENT NO. 1 JULY 2014
TO
IS 15768 : 2008 TEXTILES — RESISTANCE TO IGNITION OF UPHOLSTERED
COMPOSITES USED FOR NON-DOMESTIC FURNITURE — SPECIFICATION

(First cover page, Title) — Substitute the following for the existing title:

‘TEXTILES — RESISTANCE TO IGNITION OF UPHOLSTERY FABRICS USED FOR NON-DOMESTIC FURNITURE’

(Second cover page, Foreword, Para 5) — Substitute the following for the existing:

‘The composition of the Committee responsible for the formulation of this standard is given in Annex E.’

(Page 1, Title) — Substitute the following for the existing title:

‘TEXTILES — RESISTANCE TO IGNITION OF UPHOLSTERY FABRICS USED FOR NON-DOMESTIC FURNITURE’

(Page 1, clause 1) — Substitute the following for the existing:

‘1 SCOPE

This standard specifies requirements for the resistance to ignition of upholstery fabrics used for non-domestic furniture.’

(Page 1, clause 2) — Substitute the following for the existing:

‘2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
6359 : 1971	Method for conditioning of textiles
15612 (Part 2) : 2005	Textiles — Burning behaviour of curtains and drapes: Part 2 Measurement of flame spread of vertically oriented specimens with large ignition source
15782 : 2008	Textiles — Method for determining deterioration of visibility due to smoke released on combustion of materials
SP 7 : 2005	National Building Code of India 2005
SP 45 : 1988	handbook on glossary of textile terms’

(Page 1, clause 4.1) — Substitute the following for the existing:

‘4.1 Ignitability

The upholstered fabric shall meet the levels of ignition resistance given in Table I when tested in accordance with the test methods specified in Table I for the various categories of hazardous places/buildings as specified in Annex A in accordance with SP 7.’

(Page 1, clause 4.1) — Insert the following new clause after 4.1:

‘4.1.1 The testing shall be done as per standards mentioned in Table 1 by making the composite specimens as described in respective Indian Standards specified in Table 1.’

(Page 1, clauses 4.2) — Substitute the following for the existing:

Price Group 5

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4.2 The upholstery fabric shall meet the other quality requirements as specified in the relevant Indian Standards or as agreed to between the buyer and the seller.'

4.3 Durability of Flame Retardant Property

The covering fabric (excluding non-visible cloths such as undersides and platform covers) or fire barrier fabric shall pass the relevant ignition tests as specified in Table 1 before and after 50 *Min* cycles of washing as per the standard or the reduced washing procedure depending upon the type of textile material under test, as specified in Annex C. The covering/barrier fabric shall be conditioned in the standard atmosphere as per the method specified in IS 6359 before each washing cycle and shall be dried by any method suitable for the fabric type after each washing cycle. The covering/barrier fabric which is claimed to be dry cleanable, shall be subjected to 50 dry cleaning cycles as per the method prescribed in Annex C of IS 15612 (Part 2) and shall pass the tests as specified in Table 1 before and after 50 dry cleaning cycles.

4.4 Toxicity Index

The toxicity Index of gases evolved during burning of 100 g of upholstery fabric shall be 1.0 *Max* when tested by the method prescribed in Annex D.

NOTE — This requirement is to be tested on the upholstery fabric as delivered by the supplier before any washing.

4.5 Visibility Due to Smoke Released on Combustion

The visibility due to smoke released on combustion of upholstery fabric shall conform to either Class A or Class B when tested by the method specified in IS 15782.

NOTE — This requirement is to be tested on the upholstery fabric as delivered by the supplier before any washing.'

(Page 2, Table 1, col 1) — Insert the third category as 'High Hazard Category' in row 10.

(Page 1, clauses 5, 5.1, 5.2 and 5.3) — Substitute the following for the existing:

‘5 SAMPLING AND CRITERIA FOR CONFORMITY

5.1 Lot

All upholstery fabric pieces/rolls of identical type and composition delivered to a buyer against one dispatch note shall constitute a **lot**.

5.2 The number of upholstery fabric pieces/rolls to be selected at random shall be according to col 2 and 3 of Table 2.

5.3 Number of Tests and Criteria for Conformity

5.3.1 All the samples selected according to col 3 of Table 2 shall be tested for the requirements specified in 4.2. For all other requirements, the samples selected shall be in accordance with col 4 of Table 2. The lot shall be declared conforming to the requirements of this standard if all the samples meet the requirements as specified in this standard.

Table 2 Sample Size'
(Clauses 5.2 and 5.3.1)

Sl No.	Lot Size	Sample Size	Sub-Sample Size
(1)	(2)	(3)	(4)
i)	Up to 50	3	2
ii)	51 – 150	5	3
iii)	151 – 300	5	3
iv)	301 – 500	8	5
v)	501 – 1 000	10	7
vi)	1001 and above	10	7

(Page 3, clause 6.1) — Substitute the following for the existing:

‘6.1 Each piece of upholstery fabric material shall carry a permanently stitched and clearly readable label with the following information:

- a) Nature and composition of the upholstery material, for example, polyester/cotton blended (50 : 50 percent);
- b) Length and width, in mm and mass, in g/m²;
- c) Name and address of the manufacturer or his trade-mark(s);
- d) The words 'FIRE RESISTANT';
- e) The words '**FOR USE IN PUBLIC PLACES/BUILDINGS**'; and
- f) Any other information as required by the law in force.'

(Page 3, clause 6.3.1) — Insert the following new clause after 6.3.1:

‘6.4 BIS Certification Marking

The upholstery fabric may also be marked with the Standard Mark.

6.4.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from Bureau of India Standards.'

(Page 3, clause 7) — Substitute the following for the existing:

‘7 PACKING

The upholstery fabric shall be packed as per the relevant Indian Standard or as agreed to between the buyer and the seller.'

(Page 4, Annex B) — Insert the following Annex C and Annex D after Annex B and renumber the existing Annex C as Annex E:

ANNEX C

(Clause 4.3)

METHOD FOR DETERMINATION OF DURABILITY OF FIRE RETARDANT PROPERTY OF UPHOLSTERY FABRIC

C-1 General

The method shall be used for assessing the possible effect of repeated commercial laundering on the fire retardant property of upholstery fabrics. The effect of laundering is simulated using an automatic horizontal drum washing machine.

C-2 APPARATUS AND REAGENTS

C-2.1 Washing machine

C-2.1.1 Automatic Washing Machine, equipped with a horizontal rotating drum with reversing action. The drum shall have a diameter of 480 mm to 610 mm and shall be fitted with three or four lifters. It shall rotate at 30 rev/min to 52 rev/min and reverse its direction every 10 revolutions to 20 revolutions. The liquor level shall be capable of being controlled to both low and high levels, giving liquor volumes of 0.3V, and 0.54V, where V is the volume of the rotating drum. Means shall be provided for heating and controlling the water temperature. This automatic washing machine shall be used in accordance with the procedures specified in C-5.

C-2.2 Soft Water, with a maximum hardness, expressed as calcium carbonate, of 20 mg/l.

C-2.3 Ballast, consisting of rectangular pieces in single layers of woven 100 percent bleached cotton or 100 percent polyester. Each piece shall measure at least 350 × 500 mm and shall be hemmed along the cut edges to prevent unraveling.

C-2.4 Low-Foaming Detergent, with perborate as specified in C-2.4.1, may be used. Other similar detergents may also be used. Sodium perborate is added to the detergent immediately before use in the ratio of one part per borate to four parts of detergent. All detergent quantities quoted in C-5 are for the detergent plus perborate.

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C-2.4.1 Composition of the Reference Detergent (Informative)

As the names and compositions of reference detergents are constantly changing, it is not possible to specify the use of a fixed detergent. A recommended detergent is the ECE or IEC TAED reference detergent. This is a zeolite built detergent. Alternative detergents may be agreed upon between the interested parties.

The TAED reference detergent is supplied as three separate components which are mixed in the following mass fractions immediately before use:

<i>Parameters</i>	<i>Nominal Composition</i> (as Percent mass)
Spray-dried powder with enzyme prills	77.0
Sodium perboratetetrahydrate	20.0
Bleach activator, tetraacetylenediamine	3.0

Due to the variability of the manufacturing process and to ageing, the composition of the spray-dried powder may vary.

A typical composition of the ECE spray-dried powder is:

<i>Component</i>	<i>Nominal Composition</i> (as mass fraction)
Alkylbenzenesulfonate	7.5
C ₁₂ -18 alcohol + 7 ethylene oxide	4.0
Soap (65 % C ₁₂₋₁₈ , 35 % C ₂₀₋₂₂)	2.8
Sodium aluminium silicate (zeolite 4A)	25.0
Sodium carbonate	10.0
Sodium salt of acrylic/maleic acid copolymer	4.0
Sodium silicate (SiO ₂ : Na ₂ O = 3, 3 : 1)	3.0
Carboxymethylcellulose	1.0
Sodium ethylenediaminetetraacetate	0,2
Sodium sulfate	9.4
Water	9.6
Protease enzyme prills	0.5

NOTE — The IEC TAED detergent contains 0.2 % of stilbene-type optical whitener with the quantity of sodium sulfate reduced to 9.2 %.

C-2.5 Iron, or Press, capable of being used at a temperature appropriate for the material being tested.

C-3 COMPOSITION OF LOAD

The test specimens shall be of sufficient size for the subsequent ignitability testing. The total dry mass of the load shall be as calculated in C-4.2 and at least half the load shall consist of material under test or material of similar fibre type, the remainder consisting of polyester ballast (see C-2.3).

C-4 PRELIMINARY CALCULATIONS

C-4.1 Drum Volume

If it is not specified, calculate the volume V_1 , expressed in litres, of the rotating drum to the nearest litre, ignoring any space occupied by lifters, using the equation:

$$V_1 = lr^2\pi \times 10^{-6}$$

where

l = length of drum, in mm; and

r = radius of drum, in mm.

C-4.2 Test Load

Calculate the total dry mass m_1 expressed in kilogram, of the test load to the nearest 0.1 kg using the equation

$$m_1 = (0.060 \pm 0.004)V_1$$

C-4.3 Detergent Quantity

Calculate the mass m_2 , expressed in gram, of detergent to be added, to the nearest 0.5 g using the equation

$$m_2 = (0.30 \pm 0.02)V_1$$

C-4.4 Low Dip Level (L)

Determine the volume of water V_2 , expressed in litre, required to fill the machine to the low dip level (L) to the nearest 0.5 litre with no load present and with a stationary drum, using the equation

$$V_2 = (0.30 \pm 0.02)V_1$$

C-4.5 High Dip Level (H)

Determine the volume of water V_3 expressed in litre, required to fill the machine to the high dip level (H) to the nearest 0.5 litre with no load present and with a stationary drum, using the equation

$$V_3 = (0.54 \pm 0.04)V_1$$

C-4.6 Parameters for Typical Automatic Washing Machines (Informative)

Type	A ₁	A ₂
Volume, V_1 , (litre)	70	45
Load, m_1 , (kg)	4.2 ± 0.3	2.7 ± 0.2
Low dip volume, V_2 (litre)	21.0 ± 1.5	13.5 ± 1.0
High dip volume, V_3 (litres)	38.0 ± 3.0	24.5 ± 2.0
Detergent, m_2 (g)	21.0 ± 1.5	13.5 ± 1.0

NOTE — For some machines the dip levels are preset. Other machines require the dip levels to be adjusted to give the specified volumes.

C-5 STANDARD WASHING PROCEDURE

C-5.1 Load the machine with a load of m_1 as calculated in **C-4.2** and of the specified composition (*see C-3*). Start the machine with reduced agitation and fill with soft water (*see C-2.2*) at a temperature of 15°C to 40°C to the low dip level (L), at the same time adding the mass m_2 of detergent (*see C-2.4*) as calculated in **C-4.3**.

C-5.2 If the inlet water temperature is below 37°C, heat to $40 \pm 3^\circ\text{C}$ with no agitation. Heat to $75 \pm 3^\circ\text{C}$ in 15 ± 3 min with reduced agitation. Switch to normal agitation and run at $75 \pm 3^\circ\text{C}$ for 15 ± 0.5 min and then drain.

C-5.3 Fill with cold soft water to the high dip level (H). Run for 3 min and then drain. Repeat three times to give a total of four rinses in all. Centrifuge for 6 min.

C-5.4 Repeat the washing, rinsing and centrifuging cycles 49 times, giving a total of 50 cycles.

NOTE — If the number of wash cycles specified cannot be completed without interruption, the load may be left wet after centrifuging for a maximum of 18 h.

C-5.5 Dry the specimens in air for the material. Press them (*see C-2.5*) at an appropriate temperature to remove creases (if the material is suitable for pressing).

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C-6 REDUCED WASHING PROCEDURE

C-6.1 Load the machine with a load of mass m_1 , as calculated in C-4.2 and of the specified composition (*see* C-3). Start the machine with reduced agitation and fill with soft water (*see* C-2.2) at a temperature of 15°C to 40°C to the low dip level (L), at the same time adding the mass m_2 of detergent (*see* C-2.4) as calculated in C-4.3.

C-6.2 If the inlet water temperature is below 37 °C, heat to 40±3°C with no agitation. Run at 40±3°C with reduced agitation for 15 ± 0.5 min and then drain.

C-6.3 Fill with cold soft water to the high dip level (H). Run for 3 min then drain. Repeat three times to give a total of four rinses in all. Centrifuge for 3 min.

C-6.4 Repeat the washing, rinsing and centrifuging cycle 49 times, giving a total of 50 cycles.

NOTE — If the number of wash cycles specified cannot be completed without interruption, the load may be left wet after centrifuging for a maximum of 18 h.

C-6.5 Dry the specimens in air. Press them (*see* C-2.5) at an appropriate temperature to remove creases (if the material is suitable for pressing).

C-7 REPORT

The test report on the fire retardant property of upholstery fabric tested after washing by these procedures shall contain the following:

- a) Type of washing machine used that is automatic washing machine and its drum volume;
- b) Type of detergent used;
- c) Washing procedure employed (standard or reduced);
- d) Any deviation from the procedure specified.

ANNEX D

(Clause 4.4)

METHOD FOR DETERMINATION OF TOXICITY INDEX

D-1 GENERAL

This method explores the toxicity of the products of combustion in terms of small molecular species arising when a small sample of a material is completely burnt in excess air under specified conditions. The method does not necessarily determine the total toxicity of all the constituents of the products of combustion.

D-2 DEFINITION

D-2.1 Toxicity Index

The numerical summation of the toxicity factors of selected gases produced by complete combustion of the material in air under specified conditions. The toxicity factors are derived from the calculated quantity of each gas that would be produced when 100 g of the material is burnt in air in a volume of 1 m³ and the resulting concentration expressed as a factor of the concentration fatal to man in a 30 min exposure time. A toxicity index of 1.0 for a given volume will, on average bring about death in 30 min.

D-3 PRINCIPLE

Analytical data of certain small molecular gaseous species arising from the complete combustion under flaming conditions of the material under test are mathematically computed using the exposure level (in ppm) of each gas to produce fatality in 30 min as a base to derive a combined toxicity index.

D-4 APPARATUS

D-4.1 Toxicity Chamber – A toxicity chamber (*see* Fig. 1) consisting of the following:

a) An airtight enclosure of at least 1 m³ (approximately 100 × 100 × 100 cm³) volume lined with opaque plastic sheeting having a hinged or sliding door, fitted with a transparent plastic panel.

NOTE — As far as possible, all items of the equipment within the test chamber shall be constructed of, or coated with, an inert non-metallic material. Some gaseous products of combustion may react with or be absorbed on the walls of the chamber. The materials of construction must be chosen to minimize this. Lining of polypropylene has been found satisfactory with poly carbonate where transparency is required.

b) The chamber shall be fitted with a forced air extraction system which can be closed at the exit from the chamber when required.

c) The chamber shall be fitted with sampling positions, such that the air tightness of the chamber is not impaired.

d) The chamber shall contain a mixing fan capable of being switched on and off externally. A six-bladed axial fan of at least 200 mm diameter shall be mounted horizontally and centrally inside the chamber at roof level to ensure rapid mixing of combustion products.

D-4.2 Burner

D-4.2.1 The burner shall be capable of achieving a flame approximately 100 mm in height and having a temperature of 1 150 ± 50°C at its hottest point. The bunsen burner operating on natural gas (Methane) having a gross calorific value of approximately 40 MJ / m³ and modified to provide an external supply of air connected to the burner collar shall be used.

D-4.2.2 In order to achieve the flame characteristics stated in **D- 4.2.1**, a bunsen burner of 125 mm overall height, 11 mm bore burner tube and 5 mm bore gas and air inlet tubes shall be used.

NOTE — Gas and air flow rates of 10 litre and 15litre/min respectively satisfy the requirements but some adjustments of the flow rates must be necessary to suit particular situation.

D-4.2.3 Provision shall be made for igniting and extinguishing the burner from outside the chamber using a small pin flame on a separate gas supply.

NOTE — Unsatisfactory results will be obtained using a conventional bunsenburner drawing air from within the chamber. The effect is oxygen depletion and a consequential reduction of burner flame temperature, or even extinguishment during the combustion period of a test causing loss of standard conditions.

D-4.3 Specimen Support

D-4.3.1 A device capable of supporting the test specimen over the bunsen burner without significantly moving it from the flame, shall be provided.

D-4.3.2 The support shall be an annulus cut from a non-combustible material such as sheet steel of nominal thickness 2 mm to 4 mm, of approximately 100 mm overall diameter with a 75 mm diameter hole carrying temperature resistant wires approximately 100 mm apart to form a lattice. The complete assembly shall be equipped with a non-combustible side support arm to give a “tennis racket” appearance.

D-4.4 Timing Device

The timing device shall be capable of measuring time periods up to 5 min to an accuracy ±1 s.

D-4.5 Analytical Equipment

Any analytical system that will allow rapid detection and estimation of the gases in the products of combustion as detailed below:

- a) Carbon di oxide (CO₂)
- b) Carbon monoxide (CO)
- c) Formaldehyde (HCHO)
- d) Nitrogen oxides (NO, NO₂)
- e) Hydrogen Cyanide (HCN)

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- f) Acrylonitrile (CH₂CHCN)
- g) Phosgene (COCl₂)
- h) Sulphur dioxide (SO₂)
- j) Hydrogen Sulphide (H₂S)
- k) Hydrogen Chloride (HCl)
- m) Ammonia (NH₃)
- n) Hydrogen Fluoride (HF)
- p) Hydrogen Bromide (HBr)
- q) Phenol (C₆H₅OH)

NOTES

1 This is not a complete list of all possible gases that can be products of combustion but it does represent those most commonly perceived upon which toxicity data can be based.

2 The use of colorimetric gases reaction tube is acceptable.

3 It is obvious that there is no need to determine the quantity of, say, hydrogen chloride in the products of combustion if the material being tested does not contain chloride. Therefore, as an aid to analysis it is desirable to determine the element present in the material before an assessment of the toxicity index is carried out. If nitrogen is not found, then there is no need to analyze nitrogen containing gases i.e. nitrogen oxides, hydrogen cyanides, acrylonitrile and ammonia.

4 For the purpose of calculating toxicity indices, the following values of concentration of gases in ppm are used:

Carbon-di oxide	100 000
Carbon monoxide	4 000
Hydrogen sulphide	750
Ammonia	750
Formaldehyde	500
Hydrogen chloride	500
Acrylonitrile	400
Sulphur dioxide	400
Nitrogen oxides	250
Phenol	250
Hydrogen cyanide	150
Hydrogen bromide	150
Hydrogen flouride	100
Phosgene	25

D-4.6 Gas Sampling

In order to minimize losses of certain toxic products through absorption or condensation prior to measurement, all sampling lines shall be as short as possible. This may be conveniently achieved, where use is made of colorimetric gas reaction tubes for analysis, by siting the tubes within the chamber itself.

D-5 TEST SPECIMEN

D-5.1 Number and Size

A sufficient number of specimens (normally 3) shall be cut from the material under test. The mass of the test specimen shall be chosen to provide optimum analytical precision depending upon the nature of the combustion products and sensitivity of the analytical procedure. The size and shape of the specimen shall be such that it is entirely engulfed in the flame.

NOTE — In some instances, for example, highly fluorinated polymers, it shall be necessary to reduce the mass of the specimen to less than 0.1 g in order to achieve a concentration within the range of the currently available colorimetric gas reaction tubes for hydrogen fluoride.

D-6 CONDITIONING

Unless otherwise specified, the test specimens shall be conditioned at 27°C ± 2° C and 65 ± 2 percent relative humidity before testing (*see* IS 6359).

D-7 DETERMINATION OF BACKGROUND CORRECTION FACTOR

D-7.1 Position the burner in the centre of the test chamber floor and ignite it. Adjust the flow rates of gas and air to achieve the flame condition described in **D-4.2.1** and **D-4.2.2**. Record or otherwise control the flow rates in order that the conditions may be re-established when required. Extinguish the burner and ventilate the chamber.

D-7.2 Place carbon monoxide, carbon dioxide and oxides of nitrogen tubes in position, if this method of analysis has been adopted ensuring that all other sampling positions are sealed.

D-7.3 Seal the chamber, ignite the burner simultaneously starting the timing device. Maintain these conditions for 1 min, extinguish the flame and start mixing fan and allow this to continue for 30 s.

D-7.4 Using their respective sampling points, extract portion of the atmosphere from the test chamber to determine the concentrations of carbon monoxide, carbon dioxide and oxides of nitrogen.

D-7.5 Operate the extraction system of the test chamber, open the test chamber to free air and evacuate for 3 min. Repeat the procedure from **D-7.1** to **D-7.4**, but maintain the burning conditions stated in **D-7.3** for 2 min and 3 min in separate determinations.

D-7.6 The results obtained are graphically displayed to show the rate of build-up of carbon monoxide, carbon dioxide and oxides of nitrogen with time of burning due to the burner alone. Zero time can be shown as 0.03 percent carbon dioxide and nil for carbon monoxide and oxides of nitrogen.

D-8 SAFETY OF OPERATORS

When the toxicity index test is being carried out, there is a risk that flammable and/or toxic fumes will be given off from the specimen under test. Operators are required to take appropriate precautions to avoid exposure to the evolved fumes.

D-9 TEST PROCEDURE

D-9.1 Ensure that air temperature is $27 \pm 2^\circ \text{C}$.

D-9.2 Select a test specimen and determine its mass to the nearest mg.

D-9.3 Position the burner in the centre of the test chamber floor and establish the flame conditions described in **D-4.2.1**. Extinguish the burner.

D-9.4 Place the test specimen on the support approximately in the centre of the test chamber floor and adjust the support height so that the specimen will be sited within the flame boundary and subjected to the temperature given in **D-4.2.1** that is $1150 \pm 50^\circ \text{C}$.

D-9.5 For materials which are liable to melt and drip, test specimens may be supported on a thin bed of glass wool placed on the wire mesh sample support to prevent sample losses during the combustion.

NOTE — The glass wool found suitable for this purpose is that commonly employed as a filter membrane by analytical laboratories.

D-9.6 Ensure that the forced extraction ventilation system is off and sealed from the chamber.

D-9.7 Insert series of colorimetric gas reaction tubes in to the chamber.

D-9.8 Close the test chamber access door, turn on the fuel supply to the burner and ignite simultaneously and start the timing device.

D-9.9 The burn period shall be continued for the duration considered sufficient to ensure complete combustion of the whole specimen and record the same and extinguish the burner.

D-9.10 Start the mixing fan and continue mixing for 30 s and then switch off the fan.

D-9.11 Immediately commence sampling the atmosphere from the chamber by drawing the gas mixture through each respective detection tube in turn. It is imperative that if the presence of halogen acids is suspected, then these must be tested before other gases in order to reduce losses through absorption or condensation which may be experienced through a delayed estimation.

D-9.12 On completion of the analysis, the remaining products of combustion are removed from the chamber using the forced extraction exhaust system, initially opening the access door. Continue the forced ventilation for at least 3 min.

D-9.13 Examine the residue of the test specimen to ensure that all of the combustion material has been consumed. If any portion remains unburnt or appears to be, the whole test must be repeated using a fresh sample.

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D-9.14 Repeat the procedure specified in **D-9.1** to **D-9.13** with a fresh specimen to obtain a duplicate determination, for as many times as necessary (see **D-5.1**).

D-10 CALCULATION

D-10.1 Using the graph prepared as described in **D-7**, determine the quantity of carbon monoxide, carbon dioxide and oxides of nitrogen formed by the burner in the time recorded in **D-9.9**. Subtract these values from the total carbon monoxide, carbon dioxide and oxides of nitrogen contents determined by analysis (see **D-9.11**) to give the amounts actually produced by combustion of the test specimen.

D-10.2 Using the formula given below, calculate the concentration of each gas in ppm (C_g) produced when 100 g of material is burnt and the combustion products diffused in air in a volume of 1 m^3 :

$$C_g = \frac{C \times 100 \times V}{m}$$

where

- C = concentration of gas in test chamber, in ppm;
- V = volume of test chamber in m^3 ; and
- m = fire test mass, in g.

D-10.3 Calculate C_g for each gas in the duplicate determination. Calculate average of the values of C_g for each gas.

D-10.4 Calculate the toxicity Index as follows:

$$\text{Toxicity Index} = \frac{C_{g1}}{C_{f1}} + \frac{C_{g2}}{C_{f2}} + \frac{C_{g3}}{C_{f3}} + \dots + \frac{C_{gn}}{C_{fn}}$$

where 1, 2, 3, n represent each of the gas detected; and

C_f = Concentration of the gas in ppm considered fatal to masses for a 30 min exposure time.

NOTE — Values of C_f for various gases are given in Note 4 under **D-4.5**.

D-11 REPORT

The test report shall include the following:

- a) Full description of the material tested, including type, grade, reference number, etc.
- b) The toxicity index per 100 g of material.
- c) The following statement:

‘This test result alone does not assess the fire hazard of the material, or a product made from this material, under actual fire conditions. Consequently, the results of this test alone shall not be quoted in support of claims with respect to the fire hazard of the material or the product in actual fire conditions. The results when used shall only be for research and development of quality control and material specifications.’